
**पौधों के विकास और खरपतवारों के
दमन के लिए जूट कृषिवस्त्रादि — विशिष्टि**

**Jute Agrotextiles for Growth of
Plants and Suppression of
Weeds — Specification**

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FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Technical Textiles for Agro-tech Sectional Committee had been approved by the Textile Division Council.

Jute is a natural biodegradable eco-friendly textile grade bast fibre. Various conventional products, like, sacks, hessian cloth made from jute fibre are widely used all over the world with distinct environmental advantage. Diversified jute products, in the name of technical textiles that is geotextiles (for example, soil saver) and agrotextiles have entered into the fields of civil engineering, agri-horticulture and forestry. Apart from its wide uses as geotextile for slope protection, road construction, river bank protection, control of railway track settlement, embankment protection, mine spoil stabilization etc, it has also been effectively used as agrotextile for soil conservation, afforestation, agromulching, weed management, etc. Jute agrotextiles (JAT) provides the natural answer to faster growth of crop and plant. JAT is a natural fabric, made of 100 percent jute fibre, that helps retain soil humidity at a conducive level, arrest desiccation of soil and attenuates extremes of temperature due to the intrinsic characteristics of jute and capacity to absorb water/moisture up to about 5 times of its dry weight. On biodegradation, jute coalesces with soil, increasing its permeability and supplementing its nutrient level. JAT fosters growth of vegetation even in arid and semi-arid zones much faster than under control condition without use of manures. Additionally, the nonwoven variety of JAT can suppress weed growth effectively without use of chemical weedicides. Nonwoven JAT is a needle punched mechanically compressed fabric in such a manner that light does not pass through the plane of the fabric. JAT provides all these advantages without affecting eco-ambience adversely at affordable and competitive cost.

Jute agrotextiles comprising of woven and nonwoven types of different specifications have been developed by Indian Jute Industries' Research Association (IJIRA) in association with National Jute Board (NJB) with the direct involvement of jute industry. National Institute of Research on Jute and Allied Fibre Technology (NIRJAFT) has also undertaken extensive research work on mulching effect of jute nonwoven fabric. However, quite good number of research works followed by field trials has been conducted in association with the reputed organizations in India and abroad. Findings of the study with available data were documented.

But in view of formulation of national standards of jute nonwoven fabric as agro mulching material, another field trial was felt needed for establishing the adequacy of JAT for growth of plants and weed suppression. Accordingly, an exclusive study on 'Jute agotextiles for growth of plants and suppression of weeds' has been carried out at the research station of Bidhan Chandra Krishi Viswavidyalaya (BCKV), Kalyani, West Bengal in which the Synthetic and Art Silk Mills' Research Association (SASMIRA), the Center of Excellence on agrotech was involved to provide technical guidance as expert to conduct the study. The project was sponsored by NJB, Ministry of Textiles, Govt. of India. Role of NJB was also to provide technical input in the project, particularly on the fabric part.

Three varieties of nonwoven jute agrotextiles (JAT), namely, 500 gsm, 800 gsm and 1 000 gsm were applied on the ground. Four varieties of vegetables and two varieties of fruits were selected for the study. Yield/ha for each crops and vegetables during the two seasons were recorded. No emergence of weeds was observed in any of the plots covered with JAT. On conducting the study for 2 years twice during kharif and rabi season, it was observed that 800 gsm followed by 500 gsm JAT were found to be better performing material so far benefit cost ratio and mulching effect are concerned. Encouraging results of the study have re-established the efficacy of the JAT. Findings of the study have been submitted by BCKV to NJB which was forwarded to BIS and SASMIRA.

Installation procedure of nonwoven jute agrotextiles is given in Annex C for information only.

In preparation of this standard, considerable assistance has been derived from the 'Jute Geotextiles Techno-Economic Manual' prepared by 'Common Fund for Commodity' and the publications of some technical papers and documents of IJIRA and NJB.

The composition of the Committee responsible for the formulation of this standard is given in Annex D.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

JUTE AGROTEXTILES FOR GROWTH OF PLANTS AND SUPPRESSION OF WEEDS — SPECIFICATION

1 SCOPE

This standard provides requirements of nonwoven jute agrotexiles (JAT) for growth of plants and suppression of weeds.

NOTE — Selection of jute agrotexile shall be decided principally on topography of the site, gradient of slope, annual rainfall, nature of soil, type of weeds and plants.

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Air Permeability — *Air permeability* is the rate of *air* flow through the fabric when there is a different *air* pressure on either surface of the fabric, and it is affected by the fabric porosity.

3.2 Bursting Strength — It is a property of textile that measures its resistance to rupture, in other words the hydrostatic pressure needed to *burst* a textile expressed in terms of pressure per unit area (kPa).

3.3 Drapability — It is defined as the ability of fabric to hang gracefully around the surface or object to take its shape.

3.4 Mulch Mat — *Mulch mat* is *defined* as a textile material placed on to the soil surface as cover which protects plants, help them to grow and prevents the growth of weed.

3.5 Nonwoven Jute Agrotexiles — Nonwoven jute agrotexiles can be *defined* as textiles prepared by needle punching technique especially to be used for controlling and preserving environment and resources for various applications like agriculture, forestry, horticulture or landscape gardening.

3.6 Puncture Resistance — It is the relative ability of a material or product to inhibit the intrusion of a foreign object, in other words the maximum force or energy required to puncture the material or product.

3.7 Tear Strength — *Tear resistance* (or *tear strength in terms of force*) is a measure of how well a material can withstand the effects of *tearing*.

3.8 Tensile Strength — The ability (resistance) of a material to withstand a longitudinal force expressed as the greatest force (strength) that the material can stand without breaking.

3.9 Water Permeability — It is the property of a material to allow *water* to penetrate through it which is expressed as volume of water per unit area per unit time at specified pressure difference on either surface of the fabric

3.10 Weed Control — The attempt to prevent or control the growth and propagation of unwanted, fast growing, or invasive plants so as to limit competition for space, nutrients, water and light with agricultural forage crops or more desirable species.

4 TYPES

Based on the mass, in g/m², of nonwoven jute agrotexiles, the material is classified as follows:

- a) *Type 1* — Having mass of 500 g/m², *Min*;
- b) *Type 2* — Having mass of 800 g/m², *Min*; and
- c) *Type 3* — Having mass of 1 000 g/m², *Min*.

5 REQUIREMENTS

The nonwoven jute agrotexiles shall meet the requirements given in Table 1.

6 SAMPLING

Sampling shall be done in accordance with IS 14706.

7 PACKING

Packing shall be done as per IS 4744. Prolonged storage of packed material or its exposure to the open shall be avoided.

Table 1 Requirements for Nonwoven Jute Agrotextiles
(Clause 5)

Sl No.	Characteristic	Requirement			Method of Test, Ref to
		Type 1	Type 2	Type 3	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Mass at 20 percent moisture regain, g/m ² , <i>Min</i>	500	800	1000	IS 15891 (Part 1)
ii)	Thickness, mm, <i>Min</i>	3.5	6	7	IS 15891 (Part 2)
iii)	Width, cm	150 ± 5 percent	150 ± 5 percent	150 ± 5 percent	IS 1954
iv)	Wide width tensile strength, kN/m, [MD × CD], <i>Min</i>	1.75 × 1.5	2 × 1.5	4.5 × 2	IS 16635
v)	Tear strength, N, [MD × CD], <i>Min</i>	65 × 35	65 × 40	65 × 45	IS 15891 (Part 4)
vi)	Bursting strength, kPa, <i>Min</i>	1100	1400	1600	IS 1966 (Part 1)
vii)	Index puncture resistance, N, <i>Min</i>	175	200	300	Annex B
viii)	Air permeability (at 10 mm WG) cubic foot/square foot/s, <i>Min</i>	2.5	1.25	1.25	IS 11056 or IS 15891 (Part 15)
ix)	Water permittivity, s ⁻¹ , <i>Min</i>	3.0	1.25	1.25	IS 14324

8 MARKING

8.1 Unless otherwise agreed to between the buyer and seller, the roll shall be stenciled with an indelible ink of any suitable colour with the following:

- Product identification;
- Length and width in metres;
- Type of material (Type 1, type 2 or type 3);
- Roll Number/Lot number; and
- Other declarations required as per law in force.

8.2 BIS Certification Marking

The nonwoven jute agro-textiles roll may also be marked with the Standard Mark.

8.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations made thereunder. The details of the conditions under which the licence for use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

ANNEX A(*Clause 2*)**LIST OF REFERRED INDIAN STANDARDS**

<i>IS No.</i>	<i>Title</i>
1954 : 1990	Determination of length and width of woven fabrics — Methods (<i>second revision</i>)
1966 (Part 1) : 2009	Textiles — Bursting properties of fabrics determination of bursting strength and bursting distension: Part 1 Hydraulic method (<i>second revision</i>)
4744 : 1991	Textiles — Packaging of jute products in rolls — Specification (<i>first revision</i>)
11056 : 2013	Textiles — Determination of the permeability of fabrics to air (<i>first revision</i>)
14324 : 1995	Geotextiles — Methods of test for determination of water permeability-permittivity
14706 : 1999	Geotextiles — Sampling and preparation of test specimens
15891	Textiles — Test methods for nonwovens
(Part 1) : 2011	Determination of mass per unit area
(Part 2) : 2011	Determination of thickness
(Part 4) : 2011	Determination of tear resistance
(Part 15) : 2017	Determination of air permeability
16635 : 2017	Geosynthetics — Wide-width tensile test

ANNEX B

[Table 1, Sl No. (vii)]

TEST METHOD FOR INDEX PUNCTURE RESISTANCE

B-1 SCOPE

This test method is used to measure the index puncture resistance of nonwoven jute agrotexiles.

B-2 PRINCIPLE

A test specimen is clamped without tension between circular plates of a ring clamp attachment secured in a tensile testing machine. A force is exerted against the centre of the unsupported portion of the test specimen by a solid steel rod attached to the load indicator until rupture of the specimen occurs. The maximum force recorded is the value of puncture resistance of the specimen.

B-3 APPARATUS**B-3.1 Tensile/Compression Testing Machine**

Of the constant-rate-of extension (CRE) type.

B-3.2 Ring Clamp Attachment

Consisting of concentric plates with an open internal diameter of 45 ± 0.025 mm capable of clamping the test specimen without slippage. A suggested clamping arrangement is shown in Fig. 1. The external diameter is suggested to be 100 ± 0.025 mm. The diameter of the six holes used for securing the ring clamp assembly is suggested to be 8 mm and equally spaced at a radius of 37 mm. The surfaces of these plates can consist of grooves with 'o'-rings or coarse sandpaper bonded on to opposing surfaces.

B-3.3 Solid Steel Rod

With a diameter of 8 ± 0.01 mm having a flat end with a $45^\circ \times 0.8$ mm chamfered edge contacting the test specimen's surface (see Fig. 1 and Fig. 2).

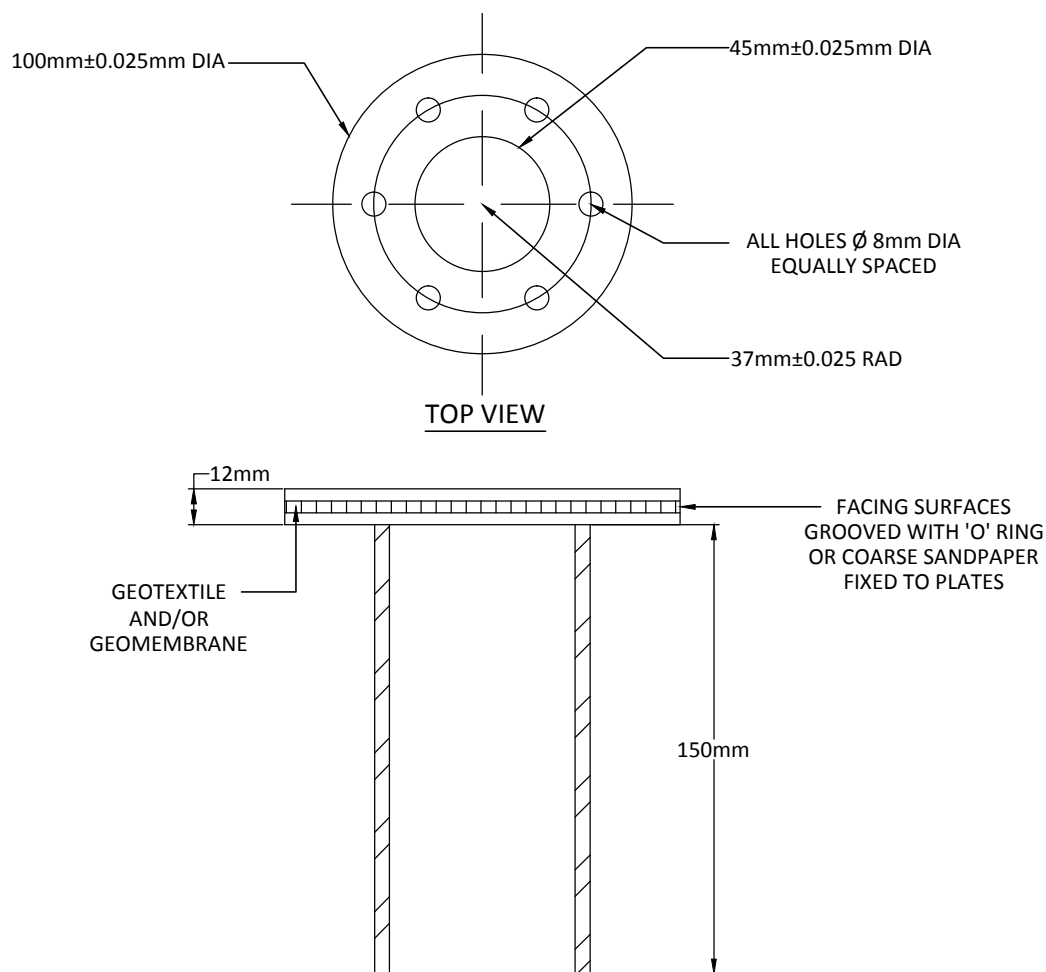


FIG. 1 TEST FIXTURE DETAIL (NOT TO SCALE)

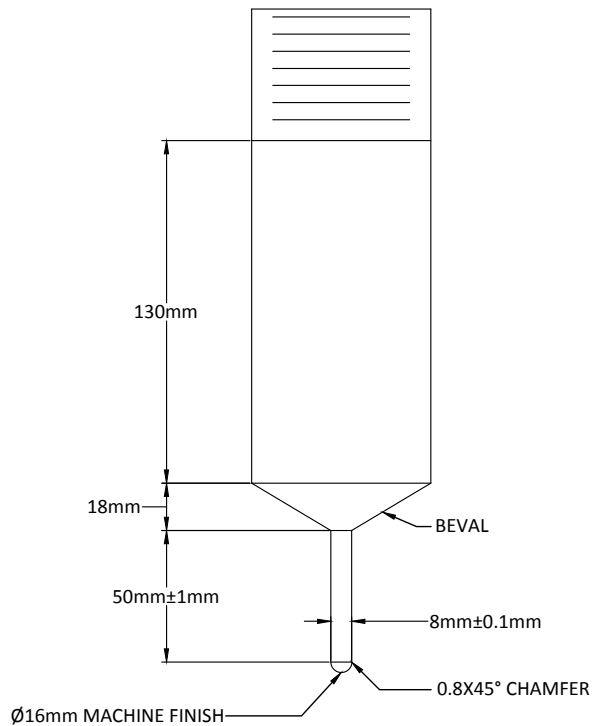


FIG. 2 TEST PROBE DETAIL (NOT TO SCALE)

B-4 TEST SPECIMEN

The test specimens shall be cut from the nonwoven jute agrotexiles and shall have a minimum diameter of 100 mm to facilitate clamping. If the 100 mm diameter sample is not available, smaller

diameter may be taken provided sample is properly clamped.

B-5 CONDITIONING

Bring the specimens to moisture equilibrium in the atmosphere for testing (65 ± 5 percent relative humidity and $27 \pm 2^\circ\text{C}$ temperature). Equilibrium is considered to have been reached when the increase in the mass of the specimen, in successive weightings made at intervals of not less than 2 h, does not exceed 0.1 percent of the mass of the specimen.

B-6 PROCEDURE

B-6.1 Select the load range of the tensile/compression testing machine such that the rupture occurs between 10 and 90 percent of the full-scale load.

B-6.2 Centre and secure the specimen between the holding plates ensuring that the test specimen extends to or beyond the outer edges of the clamping plates.

B-6.3 Test at a machine speed of 300 ± 10 mm/min until the puncture rod completely ruptures the test specimen.

NOTE — The rate of testing specified is not an indication of the performance of the specimen for its end use.

B-7 CALCULATION

Calculate the average puncture resistance of 5 specimens and standard deviation for all tests as read directly from the recording instrument.

ANNEX C

(Foreword)

INSTALLATION METHOD

C-1 The following sequence in use and installation of nonwoven jute agrotextile (JAT) shall be followed:

C-1.1 For plantation purpose the surface of the ground to be dressed, cleared of all foreign materials and prepared to the required level before installation of non woven JAT.

C-1.2 Two number of fabric pieces with proper cut marks '+' to be laid side by side keeping no gap in between in such a manner that the plant is planted

on the cut mark of the cloth. The four corners of each cut portion are to be inserted inside the cloth to keep the surroundings of the girth of the plant free.

C-1.3 The plant of desired type that is vegetable or fruit or alike to be planted on to the exposed ground keeping a safe distance in between the plants.

C-1.4 Watering may be done occasionally in case of extremely dry climate

ANNEX D*(Foreword)***COMMITTEE COMPOSITION**

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